# Session 2.5 Crop Model Improvement and Genetics Applications

*Oral Presentation*

***Title:*** **Assessing agricultural practices in highly variable environments: SARRA-H spatialized crop model for West Africa**

*Authors:* Mathieu Castets[1], C. Baron[1], S.B. Traore[2], C. Jahel[1], H. Songoti[2], P. Degenne[1], A. Alhassane[2], and D. Lo-Seen[1]
[1] CIRAD, UMR TETIS, Montpellier, France, [2] AGRHYMET, Niamey, Niger

*Abstract:* In West Africa, environmental conditions that are highly variable in space and time, in particular due to climate, impose heavily constrained choices on agricultural practices. At large scale, this variability is expressed by an annual rainfall distribution that ranges from more than 1200 mm in the Guinean Zone with double rainy season, to almost no rainfall in a single rainy season near the Sahara. This large spatial variability is also expressed at finer scales due to the stormy character of rainfall events. The length of the rainy seasons, the distribution of rainfall events and their intensity within the season all show that the variability is also temporally very large.

During the course of the season, it is essential to take into account differences in agricultural practices while assessing potential productions at different spatial scales. The integration of the SARRA-H crop model in the spatial dynamics modelling platform Ocelet offers new opportunities for this assessment. Processes can be modelled at different spatial and temporal scales and multiple data sources, including vector and raster formats, can be managed efficiently. A working prototype has been developed and is being tested during the 2016 crop season at the AGRHYMET Regional Centre in Niamey, in the framework of its Food Security Early Warning System. The objective of this presentation is to show the crop monitoring capabilities of the spatialized version of the SARRA-H crop model that integrates common agricultural practices at the scale of West Africa.

---

*Oral Presentation*

***Title:*** **Improved functions for simulating crop water use are necessary to simulate the impact of [$CO_2$] on maize yields**

*Authors:* J.L. Durand[1], K. Delusca[1], K. Boote[2], J. Lizaso[3], R. Manderscheid[4], H.J. Weigel[4], A.C. Ruane[5], C. Rosenzweig[5], J. Jones[2], L. Ahuja[6], S. Anapalli[6], B. Basso[7], C. Baron[8], P. Bertuzzi[9], C. Biernath[10], D. Deryng[11], F. Ewert[12], T. Gaiser[12], S. Gayler[13], F. Heinlein[10], K.C. Kersebaum[14], S.H. Kim[15], C. Müller[16], C. Nendel[14], A. Olioso[17], E. Priesack[10], J. Ramirez[18], K. Waha[16], D. Ripoche[9], E. R. Rötter[19], S. Seidel[20], A. Srivastava[12], F. Tao[21], D. Timlin[22], T. Twine[23], Wang[24], H. Webber[12], and Z. Zhao[25]

*Abstract:* Past increasing trends in maize yields observed around the world are at risk of slowing down due to rising temperatures and reduced water availability. However, the impact of increasing [$CO_2$] on maize remains uncertain. FACE studies report significant positive responses to $CO_2$ of maize yields (and other C4 crops) under dry conditions only. The aim of this work was to compare the simulations of different models using input data from a FACE experiment conducted in Braunschweig during 2 years under limiting and non-limiting water conditions. Twenty modelling groups using different maize models were given the same instructions and input data. Following calibration (cultivar parameters) under non-limiting water conditions and under ambient [$CO_2$] treatments of both years, simulations were undertaken for the other treatments: High [$CO_2$] (550 ppm) 2007 and 2008 in both irrigation regimes, and DRY AMBIENT 2007 and 2008. Only under severe water deficits did models simulate an increase in yield for $CO_2$ enrichment, which was associated with higher harvest index and, for those models which simulated it, higher grain number. However, the $CO_2$ enhancement under water deficit simulated by the 20 models was 20 % at most and 10 % on average only. As in the experiment, the simulated impact of [$CO_2$] on water use was negligible, with a general displacement of the water deficit toward later phases of the crop along with longer green leaf area duration at reduced transpiration rate.